

REMARKS

As a preliminary matter, claims 13-14 are amended to correct typographical errors. Namely, line 5 of claim 13 deletes a period and inserts a comma, and line 10 of claim 14 deletes a period.

The Examiner objected to the specification and the claims for the use of “a set of priors over symbol values.” Applicants respectfully direct the Examiner’s attention to the specification at page 14, lines 19 and 20, for example. The set of priors is defined as confidence levels and symbol values and in the exemplary embodiment is the output of the equalizer 22. Further explanation is also included in the specification at page 10, line 17 through 11, line 6.

The Examiner’s suggested corrections to claim 2 are appreciated and adopted. The examiner also objected to the use of abbreviations, particularly MMSE and SISO, in the claims. Applicants request the examiner to reconsider this objection. MMSE is a well-known acronym for “minimum mean-square error”, as is SISO for “soft-input soft-output”. They stand in the art without need of further definition, and their common definitions are used in the present specification. In other words, MMSE and SISO are themselves terms of art and would be fully understood by artisans. The short acronym forms, MMSE and SISO, have been used in the instant specification and claims to improve readability. Replacing the well-understood acronyms in each of their occurrences would lend no formality to the claims, it would instead make the claims more difficult to read. As but one of many examples showing that the use of well-known acronyms in claims is acceptable, the examiner’s attention is directed to the use of “CRC” for cyclic redundancy check in claims such as claims 10, 11 and 13 in the Khayrallah ‘030 patent cited and applied by the examiner. For a specific use of MMSE in claims, the Examiner can refer to U.S. Patent 6,580,701.

One final objection related to the claim 12 language concerning being “distributed about the symbol values”. Applicants submit that an artisan would understand the language, especially in view of the exemplary mapping shown in the equation shown on

page 11 and the discussion of the output distribution on the same page. Finally, claim 11 has been amended to be consistent with claim 12 and the specification.

Claims 7, 8 and 10 stand rejected under 35 U.S.C. §112. The rejection is respectfully traversed.

The Examiner states that the specification fails to explain how to configure the equalizer to implement the fast update of order M to the power of 2. The rejection is based upon an overly literal reading of the specification that would not be adopted by an artisan. Artisans understand recursive least squares (RLS) algorithms, as any standard textbook on signal processing will have a recursive least squares (RLS) algorithm and an M to the power of 2 RLS version, based on the matrix inversion lemma. See, for example, Simon Haykin, "Adaptive Filtering," Prentice Hall. An M to the power of 2 algorithm refers to fast updates of this form.

As explained in the background, a limitation of conventional schemes concerns their one-dimensional encoding nature, i.e. the transmitted signal, and received signal are both assumed to be one-dimensional (scalar) signals. Multi-dimensional channel decoding is indicated as a desirable improvement, and is relevant for both receiver arrays, or for multidimensional data as in magnetic, optical, or other storage applications. In the invention, as described in the first paragraph of the detailed description, opportunities for use of the invention include error correction code opportunities in addition to opportunities presented when data is redundantly presented to a receiver.

Under the sections entitled CREATE BUFFERS and SOFT-INPUT SOFT-OUTPUT DECISION FEEDBACK EQUALIZATION, an educational example is provided to educate artisans how fast updates are performed using the matrix inversion lemma as applied and detailed in the sections. The particular example is to the power of 3, a more complex solution than the update to the power of 2 using matrix inversion. Understanding the more complex example, and having the teaching of how to apply matrix inversion for the update, the specification teaches to artisans, who possess knowledge included in basic

textbooks (as described above), how to conduct updates to the power of 2, as well.

Claims 1, 3, 4, 9, 11 and 12 stand rejected under 35 U.S.C. §103. The rejection is respectfully traversed.

The basis for the rejection is simple and flawed in a demonstrable manner that shows why there has been no *prima facie* case of obviousness established. The Examiner applies Khayrallah. Khayrallah is primarily concerned with a particular method of equalization that makes a selective use of two channel trackers. Fading channel conditions dictate which of the two channel trackers will be used.


Khayrallah makes use of conventional decoding. As indicated in column 7, beginning on line 42, “[t]he estimator 84, which may an MLSE or any other coherent demodulator”. This much is admitted in the office action, as the Examiner admits that Kayrallah fails to teach MMSE.

The flaw in the office action is when the Examiner concludes that it would have been obvious to an artisan to substitute MMSE into Khayrallah. The sole basis for this conclusion is that MMSE is well-known. Applicants do not dispute the point that MMSE is known, but this is irrelevant to the particular obviousness question at hand in the instant application.

Each of the independent claims calls for a SISO MMSE equalization for iterative decoding. The prior art of record provides no suggestion whatsoever of a SISO MMSE equalizer, and makes no use of MMSE in iterative decoding. Iterative decoding was introduced in about 1993, the beginning of so-called turbo codes. To the inventors’ knowledge, there has been no demonstration of MMSE in iterative decoding. The SISO MMSE equalizer is also not a trivial application of MMSE, and the inventors provide a teaching of how to use MMSE in iterative decoding. No such evidence is provided in the prior art, and absent any teaching of MMSE in iterative decoding, the rejection is certainly improper. Since there has been no *prima facie* case of obviousness made, the rejection should be withdrawn.

Applicants have limited comments to those necessary to fully respond and traverse the outstanding rejections. Points not specifically addressed are not conceded. For the foregoing reasons, Applicants believe that this case is in condition for allowance, which is respectfully requested. The Examiner should call Applicants' attorney if an interview would expedite prosecution.

Respectfully submitted,
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